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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/813,115	03/31/2004	Eric J. Strang	251323US6 YA	3706

22850	7590	01/30/2008
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EXAMINER	
TUROCY, DAVID P	

ART UNIT	PAPER NUMBER
1792	

NOTIFICATION DATE	DELIVERY MODE
01/30/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.		Applicant(s)	
	10/813,115		STRANG, ERIC J.	
	Examiner		Art Unit	
	David Turocy		1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 January 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 26-37, 39 and 40 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 26-37, 39 and 40 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 1/2/08 has been entered.

Response to Amendment

2. Applicant's amendments, filed 1/2/2008, have been fully considered and reviewed by the examiner. The examiner notes the amendment to claim 26, the cancellation of claims 1-8, 11-16, 18-19, and 22-25, and the addition of new claims 39 and 40. Therefore claims 26-37, 39, and 40 remain pending in the instant application.

Response to Arguments

3. Applicant's arguments filed 1/2/2008 have been fully considered but they are not persuasive.

The applicant has argued against the Strang and Chen references, stating that the references fail to disclose continuously supplying metal precursor and pulsing the reducing agent.

The applicant has argued against the Strang reference, arguing that Strang is directed to etching process and the brief mention of improving the chemical transport in

deposition system is not enabling for applying the principles within the reference to a deposition system. The examiner disagrees. Strang goes into a lengthy discussion regarding the improved chemical transport, including the pulsing of the RF in combination results in the normal flux of mass and momentum is increase at the feature entrance. Additionally, Strang discloses that chemical transport in deposition and etching face the same unique problems and such problems are overcome by the same process of pulsing RF power to the substrate (see 0016-0017). The examiner does not disagree that the examples and in depth discussion of Strang are related to primarily to plasma etching, however, Strang clearly discloses that such steps are applicable to plasma processing system, where plasma processes include "addition (deposition) or a removal (etching)". (00018). Therefore taking the reference for all that it teaches to one of ordinary skill in the art, Strang reasonable suggests that the process, discussed in depth with regards to etching, is not limited to etching but also is applicable to deposition processes.

The applicant argues that pulsing the RF and the second gas provides the advantage of improving conformality of deposition within high aspect ratio features and the applicant discovered such an advantage. Initially, the examiner notes The mere observation of still another beneficial result of an old process cannot form the basis of patentability . *Allen et al. v. Coe*, 57 USPQ 136; *In re Maeder et al.* 143 USPQ 249. Also, Strang discloses that the technique of pulsing gases and power during the deposition process results in increasing the probability of ion neutral collision which in turn increasing the normal flux of mass and momentum at the high aspect feature. This

will increased uniformity of a self limiting deposited film due to the increased mass and momentum flux normal to the substrate surface

The applicant the argues that one of ordinary skill in the art would not predict that applying the gas and RF power pulsing technique to ALD would result in some advantage for the ALD process. However, the examiner disagrees. Chen discloses using ALD process for depositing a monolayer of material over features having high aspect ratios (0007-0008) and therefore would predict that the teachings of Strang, which discloses that pulsing the gas and RF power results in improved chemical transport, including improving the normal flux of mass and momentum at the feature entrance. Therefore one would be motivated to combine the teachings of Strang with those of Chen to reap the benefits of better improved chemical transport. Accordingly the examiner is maintaining the rejection below.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 26-37, 39, and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. (US 2003/0143328 A1) in view of Strang (WO 03/021002) and Nguyen (US Patent 6689220).

Chen teaches and plasma ALD process in which a first reactant is continuously

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fed and a second reactant is pulsed. RF power is also pulsed (figures 6, 7, and 10; paragraphs 55-58). The claimed reactants are taught (paragraph 59). The carrier gases are taught (paragraph 66). The different embodiments of figures 6, 7, and 10 read on the different claimed embodiments of the RF pulse being offset or in sync with the second reactant pulse and having corresponding widths and/or periods. Chen discloses controlling and supplying the gases through a mass flow controller (figures).

Chen discloses pulsing RF power and discloses applying an RF power to the substrate support and/or showerhead 170 (0041-0042). Therefore it would have been obvious to one of ordinary skill in the art to pulse RF power to the substrate holder in Chen as shown in the figures because Chen discloses selectively supplying RF power to the substrate support.

Chen discloses pulsing the RF power but fails to explicitly disclose the means of pulsing the RF power. However, Strang discloses pulsing power to a substrate to attract and accelerate ions to the substrate surface through the plasma sheath so that the ions arrive at the substrate moving in a direction substantially normal to the substrate (0008). Strang discloses providing a controller, amplifier, oscillator, waveform signal generator, pulse generator as required by the claims 10-16 (0020-0024). Strang discloses the amplifier periodically increases the first level of power, which ignites the plasma, to a second level of power (Figures 2-3 and accompanying text).

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to use the method taught by Strang to produce the pulsed RF power required in Chen. By doing so, one would have a reasonable expectation of

success, as Strang teaches the art recognized suitability of doing such.

Additionally, taking the references collectively, it would have been obvious to one of ordinary skill in the art at the time of the invention to pulse power to the substrate holder with a reasonable expectation of success to reap the benefits of attract and accelerate ions to the substrate surface as taught by Strang.

Chen in view of Strang fails to explicitly disclose continuously flowing a metal precursor and pulsing a reducing agent as required by the present claims. However, Nguyen teaches, at column 4, that during a plasma ALD process the source gases can either be pulsed or continuously flowed. Therefore, Nguyen discloses that it is known and suitable in the art to provide a continuous and/or pulsed flow of the source gases of an ALD process and it would have been obvious to one of ordinary skill in the art to have provided the metal precursor continuously and the reducing agent as a pulse with a reasonable expectation of successfully providing an ALD film because Nguyen discloses that pulsing or continuous flow is known and suitable in the art for formation of an PEALD film.

Alternatively, Nguyen discloses that continuous flow and pulse flow of reactant gases are known substitutes for each other in plasma ALD method and therefore the claim would have been obvious because the substitution of one known element for another would have yielded predictable results to one of ordinary skill in the art at the time of the invention. See *KSR Int'l Inc. v. Teleflex Inc.*, 127 S Ct. 1727, 1741, 82 USPQ2d.

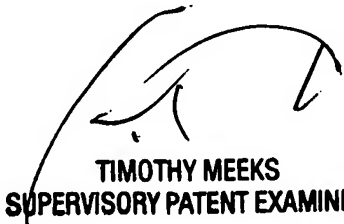
Conclusion

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David Turocy whose telephone number is (571) 272-2940. The examiner can normally be reached on Monday-Friday 8:30-6:00, No 2nd Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/David Turocy/
Patent Examiner
AU 1792



TIMOTHY MEEKS
SUPERVISORY PATENT EXAMINER